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A COMPENDIUM
OF
PHOTOGRAPHY,

CONTAINING SIMPLE AND CONCISE DIRECTIONS FOR THE

POSITIVE AND NEGATIVE COLLODION PROCESSES,

AND

Printing on Albumenized Paper,

WITH INSTRUCTIONS FOR TAKING

STEREOSCOPIC PICTURES,

THE

ALABASTRINE PROCESS,

AND

METHOD OF COLOURING PHOTOGRAPHS.

FIFTH EDITION.

PUBLISHED BY

FREDERICK J. COX,

OPTICIAN,

And Manufacturer of Photographic Apparatus,

22, SKINNER STREET, SNOW HILL,

LONDON, E.C.

A COMPENDIUM

OF PHOTOGRAPHY

POSITIVE AND NEGATIVE COLLUSION PROCESSES

By J. S. FORSAITH

WITH ILLUSTRATIONS

STEREOSCOPIC PHOTOGRAPHY

ALABAMA

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METHOD OF COLORING PHOTOGRAPHS

FIFTH EDITION

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JOHN WOOD

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29, KING'S STREET, FINSBURY

Preface to the Fifth Edition.

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In the present edition of this Compendium, I have availed myself of the most eminent authorities for the chemical manipulation, and have noted at different times various peculiarities that have occurred in my own practice: I have enlarged the chapters on Failures and Colouring, and likewise simplified the general arrangement. I would also direct especial attention to the *Printing Process*, which has been brought carefully down to the present time, and is a faithful record of the wonderful improvements which have been made in this branch of Photographic Chemistry.

I have likewise included a few directions for the production of *Alabastine Portraits*, there being a very considerable number of admirers of this process; I merely give the best and easiest method of toning the picture, but cannot personally speak very highly of the permanency of the results.

There are several other modifications of the Collodion processes, such as the application of Preservative Solutions to the surface of the film, Iodized and Waxed Papers for Negatives, &c., but they are more particularly applicable for Landscape Photography, and if noticed here, with the small space at command, would have compelled me to omit some of the details of those processes I have undertaken to describe; I would refer the reader who is desirous of practising Landscape Photography to the "*PHOTOGRAPHIC TOURIST*," where the subject is fully entered into.

I have entirely devoted the glass room on my premises to the experimental and demonstrative practice of Photographic Chemistry, and such practical information as may be required by my friends I shall be happy to afford.

The prices quoted in the Catalogue are for the most perfect instruments. Experience proves that low priced but common apparatus is bad economy, and it will undoubtedly be found that in Photography (more than in any of the other fine arts,) "*the best is the cheapest*," besides giving more satisfaction. I flatter myself the quality of the apparatus I supply will fully maintain the character our firm has enjoyed for so many years.

To purchasers of Sets of Apparatus an Elementary Lesson will be given gratuitously.

FREDERICK J. COX.

22, SKINNER STREET,

May, 1860.

Introduction.

THE art of Photography, which has recently advanced towards perfection with such giant strides, for many years attracted but little attention. We find as early as the 16th century the blackening effects of Chloride of Silver were well known to the alchymists, yet no positive steps to turn this discovery to advantage appear to have been taken before 1803, when Wedgewood communicated, in a paper to the Royal Institution, a method of producing impressions on paper or white leather, which had been previously coated with Nitrate of Silver. The objects to be copied, such as leaves of trees, wings of insects, &c., were to be laid on the prepared paper and exposed to the action of the light; the minute fibres were then found, on removing the object, remarkably distinct. The future progress of the art was stayed at this point for some years, the great difficulty being to fix the image, or rather, to prevent the paper from becoming entirely black on exposure to the light.

The discovery of Hypo-sulphite of Soda as a fixing agent was made by Sir John Herschel, who likewise recommended the use of Iodide of Potassium in connection with Nitrate of Silver, thereby laying the foundation of "Iodized Paper" which was afterwards made the subject of a patent by Mr. Fox Talbot, in which he used Gallic Acid in connection with the Nitrate of Silver, and by these means accelerated the process so as to make it really useful for copying all inanimate objects. After this important step nothing of much interest was discovered until Le Gray made known the Wax Paper process. He also began some experiments on the use of Collodion as a Photographic medium. The suggestion having been taken up in this country by Dr. Diamond, Mr. Archer, and others, in a short time the Collodion process became the favourite and useful amusement of all who turned their attention to Photography.

In describing how to take an artistic Photograph, it will be convenient to first state the general outlines of the process, and if the student will endeavour to make himself acquainted with them as a preparatory study, the manipulation described in a future chapter will be more readily understood.

There are at the present time (1860) two processes employed for Portraiture, viz.: the POSITIVE and the NEGATIVE Collodion process. They are similar in almost every respect, the preparation and composition of the chemical solutions constituting their principal distinction.

The Positive process is for taking pictures on glass, which are complete and finished in themselves.

The Negative process is that followed when the intention is to produce a paper proof; for it must be borne in mind, that paper portraits are not procured like Positives on glass by one operation in the Camera, but a Negative is taken on glass, from which the copies on paper are obtained by Photographic Printing; the glass Negative serving the same purpose that an engraved copper-plate does in common printing.

In taking a Portrait on glass, either a Positive or a Negative, there are seven distinct operations, viz. :—

- | | |
|------------------------------------|----------------------------------|
| 1st—Cleansing the Glass. | 5th—Developing the latent image. |
| 2nd—Giving it a Collodion coating. | 6th—Fixing the picture; and |
| 3rd—Exciting the plate. | 7th—Varnishing and setting. |
| 4th—Exposure in the Camera. | |

FIRST.—A glass plate is thoroughly cleaned and the surface polished.

SECOND.—It is then coated with a solution called Collodion, which serves as a foundation for the picture, Collodion being an extremely volatile fluid, which when evaporated leaves a sort of skin or film on the glass.

THIRD.—This film is to be rendered sensitive to light, for which purpose it is immersed in a solution of Nitrate of Silver.

FOURTH.—Exposure in the Camera, where it receives the impression of the optical image formed by the lens.

FIFTH.—The invisible picture formed in the Camera on the sensitive plate is developed or rendered apparent by the application of the solution called the Developer: this precipitates a white deposit on those portions of the plate where the light has acted, but leaves the shadows entirely free and clear.

SIXTH.—The Developer having completed its work must be removed by washing with water, and the picture then fixed, that is, the curtain or screen of Iodide of Silver must be removed, after this, it is again washed with water and dried.

SEVENTH.—Varnishing the picture is the final operation; practically speaking, the whole manipulation is finished at the sixth stage, but it requires to be protected from injury ere it can be considered a completed specimen.

If these preliminary remarks are carefully noted, they will materially assist in a thorough understanding of the following pages. It will be seen that the number of operations are but few, and in their practice but slight difficulty will be experienced if the dictates of common sense are followed.

APPARATUS.

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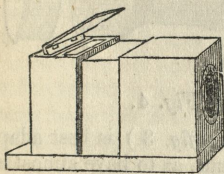


Fig. 1.

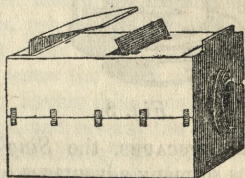


Fig. 2.

THE choice of Apparatus required for Photographic manipulation is the most important to a beginner, as without a proper degree of care is used in selecting such as is applicable to the requirements of the process employed, days and weeks of trouble may be consumed, and difficulties encountered which, with ordinary precaution, might have been avoided; if a purchaser is not confident in his own judgment, he had better rely on the respectability of the house that supplies it. The first step is to secure a Camera, which should be made of good seasoned mahogany, or walnut wood; the best kind is that known as an expanding one (*fig. 1.*) It consists of a square box, closely fitted, so as to be impervious to light—the back of which is made to slide inside the front part, increasing or diminishing its length, so as to be applicable for Lenses of different focus; and, therefore, adapted for Views as well as Portraiture; the frame that carries the prepared glass or paper is made to fit into a groove, which likewise carries a ground glass to receive the focus: care should be taken that this ground glass is fitted so as to be exactly at the same distance from the Lens as the prepared surface which is to receive the Photographic impression. If required for travelling, the ordinary form is cumbersome; and for this purpose they are made to fold, (*fig. 2.*) by which means the larger sizes will occupy so small a compass as to pack easily inside a portmanteau. Having, then, secured an Instrument suited to our requirements, we turn to the selection of a Lens.

In the early days of Photography, the ordinary construction of the Camera Lens was a *meniscus*—these will do for the simple copying of figures, where length of time is not an object of much importance; but as the chemical and optical foci do not coincide, there must be an allowance made for this purpose, after the Image has been adjusted on the ground glass of the Camera; this difficulty is overcome by using an *Achromatic*,

which is a combination of two glasses—one being made of flint, and the other of crown, by means of which a flatter picture is obtained, together with a much greater degree of sharpness.

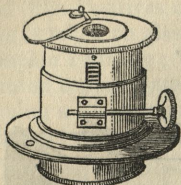


Fig. 3.

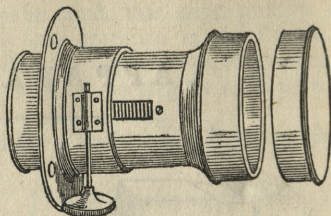


Fig. 4.

For LANDSCAPES, the *Single Achromatic* (fig. 3.) is best adapted; it possesses so many advantages over the meniscus, as to have almost entirely superseded it.

For PORTRAITS, or any purpose where the objects are likely to move, the *Double Combination Lenses*, (fig. 4.) consisting of a set of four glasses mounted in a brass tube, are to be preferred: they possess great rapidity of action; and when really good, give very sharp and clear definition. If the glasses are removed from their cells, in order to be cleaned, it is of the greatest importance that they are replaced in their proper relative positions.

The construction of a Portrait Lens will be understood from fig. 5.

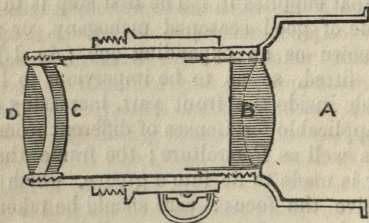


Fig. 5.

A represents the hood or front of the brass work; B, a combination of two glasses,—which we will call the *front lenses*. C and D, the two glasses which may be termed the *back lenses*, and are placed at the end of the tube which screws into the Camera. When placed in position for portraiture, the lens, B, (which, although it consists of two glasses, appears like one, as they are cemented together with a transparent gum,) must be placed in its mounting with the convex surface outside, or next the sitter. The two back lenses are easily recognized, as they are of different shapes, one being a *double convex*, that is, thick in the centre and thin at the edge, the other is a *meniscus*, or hollow, like a watch glass. In placing these in their cells, if they have been removed, first put in the double convex, the flattest side

to be downwards ; over this, the meniscus, with its concave side down or next to the convex : the two glasses are separated or prevented from touching each other by means of a brass ring. When Lenses of this description are to be used for distant objects or views, they require a special adaptation, in consequence of the impossibility of getting objects at different distances in focus at the same time ; but which can be done at a slight additional cost.

A lens that has been made to adapt for both portraits and views, will have the glasses in the same position for taking portraits as has been described ; but to make it suitable for views, you remove the back glasses, c and D, (*fig. 5.*) and place them carefully away to preserve them from injury, as they are not now required ; then screw the brass mounting back into the flange that is fixed on the Camera ; having done this, unscrew the large brass hood that is in front of the lens, and reverse the front glasses in their mounting, so as to place the flattest side of the glass outside or next the view ; having replaced the brass hood, insert into it a stop or diaphragm, and proceed to work in the usual manner.

Where expense is not an object of very great importance, a more efficient plan is to remove the front lenses, B, (*fig. 5.*) and screw them into a separate and distinct mounting, similar to *fig. 3*, by this means the chance of reflection from the sides of the long tube is avoided.

In many instances, where groups are required to be taken, it will be necessary to insert stops into the combination, (*fig. 5.*) or those near the Camera will not come into the same focus as those situated a further distance ; the proper position is in the centre, nearly midway between the lenses B and c. In the best instruments there is a contrivance for doing this without unscrewing the glasses ; care must however be taken, or there will be a reflexion from them.

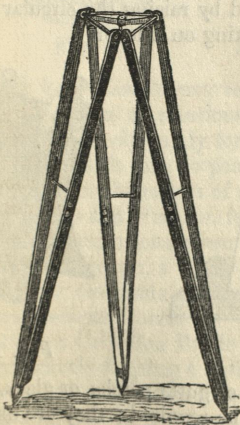


Fig. 6.

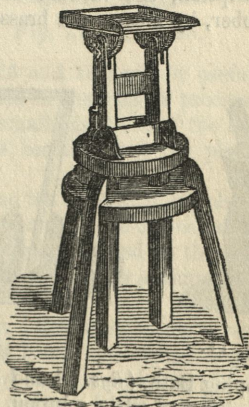


Fig. 7.

For supporting the Camera, a Stand will be requisite, which should be from three to four feet high: they are made of different descriptions—the ordinary tripod stand, (*fig. 6.*) with a brass screw to fix the Camera with, is the most portable, and therefore best adapted for travelling. There is another kind with a table-top, moving with a ball and socket motion, by which means the Camera can be placed at any angle; this is also a very convenient form. To use in a room, where portability, &c. is not so much an object, there is nothing equal to the firm Oak stands; (*fig. 7.*) they are heavy, but this is a great advantage, the whole being so solid as to prevent any vibration. Stands are also made in cast Iron, but they are not so steady as good Wooden ones.

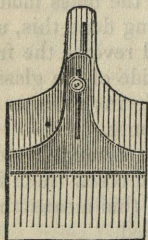


Fig. 8.

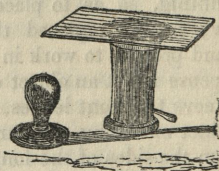


Fig. 9. Fig. 10.

Fig. 8 represents a Plate Holder, for holding the glass plate whilst being cleaned, and will be found very convenient, as it avoids the necessity of touching the glass with the fingers whilst performing this operation; and for large glasses, the Pneumatic Holders (*figs. 9 and 10*) are required to sustain the plate while applying the Collodion coating. *Fig. 10* is of the best description, the vacuum being caused by raising the circular piece of India-rubber, by means of a brass pin working on a lever.

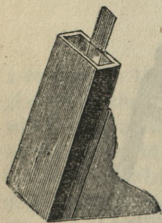


Fig. 11.

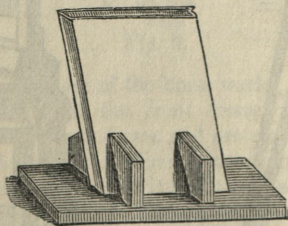


Fig. 12.

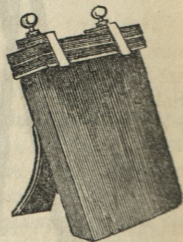


Fig. 13.

A Dipping Bath, (*figs. 11 and 12*) made of gutta percha, or glass, to contain the nitrate of silver solution, will also be required; they are used with a slip of glass or gutta percha, called a Dipper, for more readily inserting

the glass plate. These baths are likewise made of porcelain, but the glaze is liable to crack, which renders their use very objectionable.

When wanted for travelling, the water-tight top (*fig. 13.*) will save the trouble of carrying an extra bottle for the solutions, and, likewise, diminish the risk of spoiling the silver bath by any foreign matter coming into contact with it.

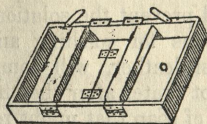


Fig. 14.

After having taken a Negative Picture on glass, a Pressure Frame (*fig. 14.*) is required, to produce the paper copies; they are made of various sizes, one sufficiently large to take the negative with a small margin round it, is recommended, and the back board should be jointed, the utility of which will be seen from the description of its use, given under the head of Positive Printing, in a future chapter.

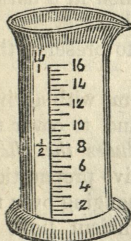


Fig. 15.

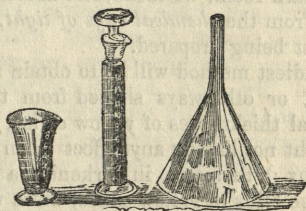


Fig. 16. Fig. 17. Fig. 18.

Three or four Glass Measures (*figs. 15 and 16,*) will be useful to measure the proportions of solutions mentioned in the various processes; they are likewise extremely handy for holding small quantities of the Developing Solution, &c., as it can be poured more readily, over the plate, by this means, than from the mouth of a bottle.

Sets of Scales and Weights, for weighing the chemicals, are also required. The chemical proportions given in the formula for solutions are according to apothecaries' weight, a table of which will be found on the last page of this book; but chemicals are always bought and sold by avoirdupoise, and not by the apothecaries' ounce.

Fig. 17 is a Collodion Bottle or pourer. Collodion being a preparation that is constantly forming a sediment, this bottle is designed to prevent its being disturbed every time it is used; for the convenience of mixing the collodion and iodizing solution, some are graduated like the measures, into drachms and ounces.

Funnels, (*fig. 18*) are made in glass or gutta percha; several should be at hand, or great care must be exercised to clean them thoroughly each time they are used. They are also required in filtering solutions; for this purpose, take a sheet or circle of filtering paper, and fold it into four, then again into eight, open it fully and press it into a funnel; by this means, there will be plenty of vent for the air to escape, otherwise, the paper will be flat against the glass, and prevent the solution from percolating through.

Two or three porcelain pans for washing and preparing paper, some clean linen cloths, and a wash leather, will complete the requisites. The cloths should be rinsed in hot water after they have been washed, in order to free them from any trace of soap that might remain. An elastic India-rubber bottle will be very useful to blow the dust off the plates after they have been cleaned.

OPERATING ROOM.

The third, fourth, and fifth operations in producing a Collodion Picture, require for their success that they should be performed in a dark room. By the term dark room, we mean, not absolutely a dark closet, but one that is protected from the *chemical rays of light*, in order to preserve the sensitive plate whilst being prepared.

The readiest method will be to obtain a small room, with a window facing the north, or otherways shaded from the sun, and to cover the window with several thicknesses of yellow calico, which *excludes the chemical rays*, (yellow light not having any effect upon the sensitive preparations used in Photography;) therefore, in darkening a room by hanging over the window two or three folds of yellow calico, there will be sufficient light to observe the progress of manipulation, without interfering with the chemical action. If yellow daylight cannot readily be obtained, a candle or lamp may be used, provided the direct light is shaded by a screen of yellow calico or glass. The room selected for this purpose must be kept particularly free from dust and dirt (no carpet, mat, or rug on the floor) and a table or bench should be fixed immediately under the window, with a sink or basin, and a pipe to convey away the waste water, either direct into the drain or into a pail underneath; a shelf to hold the bottles; and, over head, a zinc or wood tub to contain a supply of water, for washing, &c., which may be conveyed down by a small pipe, fitted with a stop-cock of about $\frac{1}{4}$ -inch diameter; this will furnish a steady stream, and be found much more convenient than pouring it from a jug.

For the proper production of pleasing Portraits, a Glass Room is requisite. By this, I do not mean one all glass, which is a very common fault; but one, the two ends of which are opaque, and the sides and roof glass, capable of being shaded with gauze blinds; by these means the light may be so modified as to prevent an undue quantity falling on one portion of

the figure. The end of the room opposite the sitter should be painted of a dark colour, to afford rest for the eyes.

Unless the convenience of a glass room is to be had, Photographic Portraits are best taken in the open air; however, as it is not at all times feasible to do so, the photographer must arrange an apartment, according to the means he has at command; and in selecting a room, he must bear in mind that, it not only should have a good side light, but also a skylight, if it can be obtained; a room receiving the light from the north, or north-west, is preferable to others.

It is a very common error among amateur photographers that a quantity of light is essential, but if the quality is good that is sufficient; I mean, that in the early part of the day there is often a chemical effect produced on the sensitive plate with far less exposure, than later in the day, when to all appearance the light is in the same condition; therefore, it follows, that when the light is vigorous, a smaller quantity may be employed, and this allows the photographer to shade, by means of curtains, such portions of the sitter as will give a contrast of light and shade; if the chemicals are in good working order, it depends *entirely* on this adjustment of screens, whether the picture is an artistic portrait or a vulgar caricature.

In a strong light, it will be advisable to shade the top of the head, or that portion of the picture will be overdone before the darker portions of the dress are sufficiently lighted; to effect this, hang over the head of the sitter a blind of thin blue gauze, which should be suspended, if possible, two or three feet over-head, and in such a manner, that it could be wholly or partially removed; this will be found to have a very beneficial effect in producing the half-tones, and perfecting the detail. To sum up the foregoing remarks: the principal source of light should be from above the sitter, falling obliquely, so as to leave one side of the face in a partial shadow.

A perfectly vertical light solarizes the top of the head, producing white hair, and deep shadows under the eyes.

A horizontal source of light will destroy the shadows of the brow, nose and chin, giving a flat appearance to the face, and a deathly glaze to the eyes.

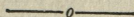
No direct light must enter from a horizontal source, or it will fatigue the eyes of the sitter; this is most important, and is the reason why I have directed the opposite end of the glass-room to be painted black.

The selection of a proper back ground is another matter of some importance. A simple white wall will do very well, if the light falls evenly over it; but, as a general rule, something rather darker will be preferable, the exact shade is not a matter of much importance; a large blanket tightly strained over a frame gives a very good effect, if a light color is desired; but I prefer something darker than this, and the way I have prepared several, both for my own use and for friends, is to procure some calico sheeting, about two yards square, and having made a light wood frame the same size, nail the sheet over this, straining it tightly; then

make a composition of whiting and water, adding a small quantity of yellow ochre to get the desired shade, and brush this over the screen—you will have to give it several coats to get a tolerably even surface; but it is not essential that the marks left by the brush are entirely removed, as they will not show in the picture: the color should be made of the consistence of cream, and a small quantity, (about half-a-pint to a pailful) of size added to prevent its rubbing off. If the sitter is dressed in light clothes, or has a remarkably fair complexion, white hair, &c., a back-ground of black velvet is preferable; it throws the picture out with greater boldness; but, which ever is used, care must be taken to bring the sitter well forward, so as to prevent the flatness that will arise from the background being in the same focus; and care should be taken in arranging groups, to place the several persons at the same focal distance from the Camera, or in a semicircular position. Extreme colours of dress are to be avoided, the more simple and plain the better; and if there be a choice, neither black, (especially velvet) white or blue, are advisable; they require such a different time of exposure, compared to the features, that something must pay the penalty—either the dress or the complexion; checks or plaids are most effective.

Having now concluded these preliminary remarks, which are applicable in every degree both to Positives and Negatives, we will enter upon the process of taking a picture,—first, the

POSITIVE COLLODION PROCESS.



This, for convenience, I shall divide into two sections, viz., chemicals and manipulation.

CHEMICALS.

The chemicals used in photography are neither numerous or difficult to obtain. For the Positive Collodion process there are the following solutions required:—

Cleansing Solution.
Iodized Collodion.
Nitrate of Silver Bath

Developing Solution.
Fixing Solution.
Varnish.

And for making these, the chemicals are—

Tripoli.
Nitric Acid.
Iodized Collodion.
Nitrate of Silver.
Proto Sulphate of Iron.
Nitrate of Lead.

Glacial Acetic Acid.
Formic Acid.
Alcohol.
Cyanide of Potassium.
Varnish.

I shall now describe the preparations of the Solutions by the aid of the chemicals before mentioned. The first will be the

CLEANSING SOLUTION.*

Tripoli.....	2 drachms.
Water.....	2 ounces.
Nitric Acid.....	1 drachm.

First, intimately mix the Tripoli and water, and afterwards add the Nitric Acid. This ought to be kept in a large-mouth bottle and labelled. I will here give a caution against putting bottles away without previously labelling them, as it is impossible to remember after a lapse of time, what each solution really contains.

—o—

COLLODION is the most important chemical used. I have in previous editions of this work given a formula for its manufacture; but the difficulty of producing constant and satisfactory results, except after long practice, has induced me to omit that description; it is mainly useful as an experiment, which will afford a good practical lesson to the amateur, after he has had some experience; but for elementary purposes it had better be postponed. Those who wish to try the experiment are referred to the "PHOTOGRAPHIC TOURIST," published by me, where full instructions will be found. It will be sufficient for our present purpose to state that it is formed by dissolving Gun Cotton in a mixture of Sulphuric Ether and Alcohol; and, after this, Iodized by the addition of Iodide of Ammonia, or other salt; after this has been added, it begins to decompose, and will not retain its sensitiveness for a very long period;† and as Collodion is extremely volatile, it must be carefully preserved from the air in close stoppered bottles. Should the Collodion become too thick to flow evenly over the glass plate, it may be thinned by the addition of a few drops of pure Rectified Ether, until it is sufficiently limpid. It will be as well to remember, that it must not be used in the vicinity of a burning candle, or fire, as the vapour might ignite.

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NITRATE OF SILVER, for the preparation of the Exciting Bath, may be used in the form of crystals, and in making solutions in which this salt is employed, *Distilled Water* only should be used.

EXCITING BATH.

Nitrate of Silver	30 grains.
Distilled Water.....	1 ounce.

Thoroughly dissolve the Silver in the water, and afterwards add one drachm of Iodized Collodion and three drops of Nitric Acid to about twelve ounces of the Silver Solution, let it stand a few minutes and filter through filtering paper.

* Instead of this Solution, Fisher's Lipaskathairon may be employed.

† FISHER'S Positive Collodion is an exception to this rule.

DEVELOPING SOLUTION.

This ought to be made in two separate solutions, and then mixed together thus—

Proto-Sulphate of Iron 4 drachms.
Distilled, or Soft Water 10 ounces.

and let it thoroughly dissolve; but as it is rather slow in doing so, a small pestle and mortar (*fig. 19*) will be very useful. In another vessel dissolve



Fig. 19.

Nitrate of Lead $2\frac{1}{2}$ drachms.
Distilled, or Soft Water 10 ounces.

(again using the pestle and mortar, if one is at hand,) and pour the whole of this into the Solution of Iron, a white deposit is immediately thrown down, which is insoluble in water. The solution is now to be filtered through filtering paper and the following acids added:—

Glacial Acetic Acid $2\frac{1}{2}$ drachms.
Formic Acid $1\frac{1}{2}$ ”
Alcohol 2 ”

The Iron and Lead will be found to dissolve more readily in hot water, but it must be allowed to cool before the acids are added.

— o —

FIXING SOLUTION.

CYANIDE OF POTASSIUM, for fixing the picture. As this is a rather dangerous poison, care must be used to prevent accidents, and avoid its entering a scratch or wound on the hands. I do not think, under any circumstances, the weak solution used for fixing, could do any injury; but it is a common practice to rub the hands with a small portion, to remove the stains that are caused by the chemicals that are spilt over them. In preference to using Cyanide, employ Iodide of Potassium, which is perfectly harmless and quite as effective. India-rubber finger stalls are made to protect the fingers from stains. *Hypo-Sulphite of Soda* may be used for fixing, but the whites of the picture are not so good.

In a four-ounce wide-mouth bottle, dissolve

Cyanide of Potassium 20 grains.
Soft, or Distilled Water 2 ounces.

— o —

All these solutions may be made in quantity, as they will keep good almost an indefinite length of time, except the developing, which ought not to be made more than two or three weeks before it is wanted; should its action become too slow by age, the addition of a small portion of Iron will revive it.

MANIPULATION.

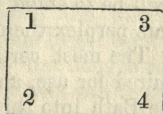
At page 2, we have stated that there are seven distinct operations in the Collodion process. Assuming, therefore, that the apparatus and chemicals have been prepared as previously directed, we will proceed to take a picture,

CLEANING THE PLATE.

The Glass should be cut from the best Patent Plate, or flatted Crown; and the edges may be ground, to prevent cutting the fingers. Both must be of the best description, as a small scratch, or air bubble in the glass, may spoil an otherwise good portrait. Having selected pieces of glass free from blemishes, proceed to clean them by washing with water, in which a little Soda, or Cyanide of Potassium has been dissolved; this is to free them from any trace of grease. They should afterwards be well rinsed in water, and wiped dry with a clean linen cloth; then mark one side, and rub it well with a piece of cotton wool, using the *Cleansing Solution** (page 11); again wash the plate with water, and wipe it perfectly dry; now lay it on a flat board or the plate holder, (*fig. 8*) and polish with a wash leather. By breathing on the glass the surface may more readily be seen, and if smears are visible, wash and clean the glass again. The readiest way will be, to clean a stock before commencing operations, and stand them by in a Plate Box until required. If the glasses are not entirely free from grease, there will be a difficulty in running the Collodion evenly over them, the dirt would also be sure to show in the finished picture: when you have a perfectly clean surface, blow off, with the elastic bottle, the loose dust which has settled on the plate, and proceed to give

THE COLLODION COATING,

which is best done by holding the glass by one corner, between the forefinger and thumb of the left hand, and pouring on the centre a good quantity of Collodion, letting it run evenly over the whole surface, and finally drain off at the corner into the bottle. The inexperienced may find some little difficulty in obtaining an even film of Collodion; the readiest way will be to hold the glass by the corner marked (1)—



pouring on to the centre of the plate as much Collodion as it will easily hold; tilt the glass so as to let it run to the corner marked (2), then towards

* If Fisher's Lipaskathairon is used, there will be no occasion to wash the glass with water.

the corner it is held by, carefully avoiding the thumb, and slant in the direction of corner (3), draining it off at (4); then rest the plate in a vertical position on the neck of the Collodion bottle for a few seconds.

When the plate has been coated with Collodion, allow it about a minute to set, (in warm weather, however, the operation cannot be too quickly performed,) and immerse it in the *Nitrate Bath*, which is called

EXCITING THE PLATE.

Up to this point the manipulation may be conducted in the day light; but as the immersion of the Collodionized plate renders it sensitive to light, recourse must be had to a dark room or closet, as described in page 8; in default of this convenience, the work may be performed by the light of a candle, shaded by a screen of yellow calico or glass. Lanterns with yellow shades are made for this purpose.

The Dipping Bath (*fig. 11 or 12*) having been filled with the Silver Solution, place the prepared glass on the Dipper, (which is supplied with the Trough) and immerse it in the Silver Solution, steadily, but without hesitation, as the slightest pause will be sure to produce lines, that would afterwards show, in developing; when the glass has remained in the Nitrate of Silver Solution about half a minute, or more, it should be withdrawn, and again immersed two or three times, to insure the proper action of the Silver upon the Iodide in the Collodion, which will take from two to three minutes, varying with the temperature; but this will be known by the film ceasing to have the greasy appearance which it at first presents. When this is the case, it should be withdrawn from the Bath, and stood on some blotting paper, just to drain, and then it is ready for the exposure in the Camera.

As the chemical constitution of the Bath is constantly altering, it is advisable to test the liquid, occasionally, before commencing; for should it be at all Alkaline, the pictures will appear foggy:—immerse in the Silver Solution a piece of blue litmus paper; if it retains its colour after being immersed half a minute, add a drop of Nitric Acid, which has been diluted with ten times its bulk of Distilled Water; should this not be sufficient, add another drop, or more, until the paper just begins to take a pink tint. But should the pictures come out foggy when the Bath is found to be *slightly* acid, the best course will be to stand it by for a few days, and it will clear itself; many operators perplex themselves by constantly tampering with the Silver Solution. The most certain method will be to make about double the quantity required for use, and keep the surplus in a large bottle; occasionally empty the Bath into this bottle, let it stand all night to settle, and when the clear portion is carefully poured off, it will generally be found to work well. In warm weather the quantity of Silver may be reduced to 25 grains to the ounce; and in winter even 35 grains will not be found too strong.

The Plate having been drained from the excess of Silver Solution, but

not dried, is to be placed Collodion side downwards in the dark slide belonging to the Camera, and proceed to the fourth operation, *viz.* :—

EXPOSURE.

Your sitter being placed in a proper position, and the Camera fixed on the stand, (which must be either elevated or depressed, until the image is in the centre of the ground glass,) proceed to Focus it,* which is done by turning the milled-head screw on the brass front until there is a perfectly clear and defined image presented on the ground glass.

In obtaining the Focus of the object on the ground glass—an operation of delicacy, and on which depends the sharpness of the resulting picture—it is advisable to employ a Focussing Glass. They are made of two descriptions; the cheapest is japanned tin, and which magnifies the image to a very considerable extent; but the most perfect form of instrument, is that shown by *fig. 21*, which not only enlarges the image, but also renders it erect on the ground glass of the Camera, thereby enabling the operator better to judge the results.



Fig. 20.



Fig. 21.

A small portable form of focus glass is shown in *fig. 20*, which possesses very considerable power, but does not erect the image..

When the greatest degree of sharpness is obtained on the ground glass replace the cap of the lens, insert the dark frame containing the Collodion plate, and desire the sitter to look steadily at a *dark* object about the height of the Camera, then take off the cap, and allow the plate to remain exposed to the influence of the light. The time of exposure will vary with the intensity of the light, and the power and aperture of the Lenses. With the Double Combination, in an ordinary light, from six to ten seconds will be the average time required; this will be known by the appearance of the plate in the Development; and experience will afford the only guide.

The proper attitude of the person sitting for the portrait, must be left to the individual taste and judgment of the operator; but avoid all exaggerated postures, so as to keep the whole of the body in one focus; and the sitter ought to have time to get comfortably seated and accustomed to the light, before the cap of the lens is removed. It will generally be found that the most pleasing effects will be gained by taking side, or three quarter face, in preference to the direct full face, and I am rather inclined to admire portraits that are taken about half length, or even merely the head and shoulders, especially for paper pictures.

* A dark cloth or velvet is thrown over the end of the Camera, and by darkening the ground glass, the operator is enabled to see the image.

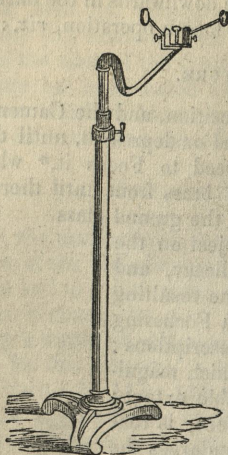


Fig. 22.



Fig. 23.

Head rests are for the purpose of steadying the head while the portrait is being taken, the slightest movement of the sitter causing a double image, or, at least, mars the distinctness of the picture. They are made of various descriptions, either to screw to the back of the chair, as shown in the figures, or mounted on a heavy iron foot to support themselves.

After this digression, we will return to the Manipulation; and having obtained the focus on the ground glass of the Camera, and exposed the plate to the action of the light, you must close the sliding shutter, and take the dark slide containing the plate back to the dark room, in order to

DEVELOP THE PICTURE.

On removing the plate from the Camera, there will not be the slightest trace of any image visible, but its quickly makes its appearance, by means of the *Developing Solution*, page 12 or FISHER'S *Developing Solution*, which is sold ready for use.

Having carefully excluded all white light from the operating room, hold the glass by the corner that you held it by when coating it with Collodion, and pour on a sufficient quantity of the *Developing Solution* to run equally over the whole surface; if it does not flow evenly, a stain will inevitably be formed. Begin by pouring it on at one edge, running it along, and gently inclining it, to let it flow uniformly over the plate; the first effect will be the appearance of the white lights, such as the lighter portions of the dress, &c.; then the half-tones, and finally the darker shades; when these appear, it should be well washed with a gentle stream of water, to remove the *Developing Solution*, and it is now ready for fixing, which is

simply the removal of the Iodide from the surface of the Collodion film. By this time we are able to form an opinion as to the success of our manipulation.

If the strong lights of the picture, such as the face or shirt front, make their appearance simultaneously with the half-tones, and the picture presents a pale white *washy* tone, the exposure has been too long; but, on the contrary, if, after developing some time, only the high lights make their appearance, you must let the next plate remain longer in the Camera exposed to the luminous ray. The next operation will be to

FIX THE IMAGE.

For this purpose, after having well washed the picture, and removed the Developing Solution, use a solution of Cyanide of Potassium (page 12). The readiest way will be to pour this mixture over the plate in the same manner as the Developing Solution, until all the creamy appearance is removed; when that is the case, it must be well washed in a good supply of water, (at least a pint should be poured over it,) and afterwards set up on edge to dry; as the Collodion film is very tender, and liable to be rubbed off with the slightest touch, it must be protected from injury in some way, which brings us to the last operation, called

VARNISHING AND SETTING.

The usual way of doing this has been to cover the surface with a transparent varnish; the best for Positives is prepared with benzole, sold under the name of CRYSTAL VARNISH. It will dry, and give a good surface if used cold; but if a slight warmth is communicated to the plate it is better. The readiest way of applying this varnish will be, to pour it over the plate in the same manner as the Collodion, draining it off into the bottle.

The picture is now finished, and may be mounted in a frame or case with a piece of black or deep marone colour cotton velvet behind it, or varnished with jet varnish, which should be poured over the plain side of the glass, and not on the Collodion surface: to avoid this trouble, the picture may be taken on black glass, when no backing up will be required; and it answers the purpose very well, but is rather more expensive. In mounting the pictures, put them into cases with gilt mats, or morocco trays, which are suitable for hanging up. If a Passe-Partout is used, it ought to be of a dark colour, as the white ground against a positive picture will, by contrast, spoil the tone. When properly finished and mounted, the lights and shades will be shown equal to a Daguerreotype, without its unpleasant glare.

NEGATIVE PROCESS ON GLASS.

The production of a Negative picture depends mainly on the time of exposure, and the nature of the solution used in developing; with these exceptions, you will proceed in precisely the same manner as for Positives.

But, previous to describing the Manipulation it will be advisable to clearly understand what is meant by the terms Positive and Negative as applied to Photography.

A Positive picture when laid upon a black cloth or other dark material, shows the lights and shades in their natural positions ; thus, the coat is transparent, and therefore allows the dark backing of the picture to show itself through the Collodion film ; whilst the opaque portions of the picture (such as the face or hands,) will appear white from the reflection of the silver that has been deposited there ; but if it is held up and viewed as a transparency, the face, hands, and other light parts, appear *slightly* opaque or black, while the shadows, being transparent, allow the light to be seen through them, and consequently appear white.

Now, what is termed a Negative, is, in reality, an over-exposed and over-developed Positive ; to a certain extent it will show as a Positive, when laid upon a dark ground, but not effectively, for the graduations of tone, (which is the great charm of a Positive) are not to be distinguished, and the shadows of the picture appear to be slightly foggy ; but if held up to the light, and viewed as a transparency, the whole of the detail will be most faithfully seen ; therefore a Positive is also a Negative when viewed in this manner, but not of sufficient *intensity* to yield a copy on prepared paper.

Presuming that the operator fully understands the peculiarity of the picture he is desirous of producing, we will now progress to the preparation of the

CHEMICALS.

NEGATIVE COLLODION differs from Positive mainly in the thickness of the film left on the evaporation of the Ether, but also in the preparation of the Iodizing Solution, for with Positives a thin film, giving a bright surface to the whites, and clearness of shadow, yet preserving the half tone in the darker portion of the picture, is indispensable ; but for Negatives, a greater amount of opacity is needed ; a weak Negative will not produce rich and full tones in the paper proof, while the colour of the picture is not of much moment, provided it is not foggy. In consequence of the necessity of more highly Iodizing the Collodion, together with the difference in its chemical composition, decomposition takes place much earlier ; therefore, it is not expedient to iodize more than is likely to be used in the course of two or three weeks,* as after that time, it begins to work much slower, requiring a longer exposure in the Camera.

FUSED NITRATE OF SILVER is produced by dissolving pure Crystals of Nitrate of Silver in distilled water, and evaporating to dryness ; afterwards they are to be fused at a low temperature, which expels the remaining trace of nitric acid. An advantage for the negative bath.

* These remarks apply to the ordinary Collodions of Commerce. Fisher's Negative Collodion does not appear to undergo any perceptible change for seven or eight weeks after it has been iodized. In all cases where the stock would not be exhausted in that time, it had better be purchased in separate solutions.

PYROGALLIC ACID is used in the composition of the Developing Solution; it is a brilliant white laminated crystal, produced by exposing Gallic Acid in a closed retort to a high temperature.

CITRIC ACID. I have made many experiments with Citric Acid and with Glacial Acetic Acid, to determine which is preferable for Negative Developing Solution; as respects portraiture, I am satisfied that Citric Acid not only works cleaner, but produces a better toned picture, I have, therefore, inserted it into the formula; for copying engravings, or in landscape work, Glacial Acetic has some advantage.

HYPO-SULPHITE OF SODA, for fixing the picture, should be used carefully, or it will interpose itself between the collodion film and the glass plate, where it is very difficult to remove. Another precaution is, to wash the hands after its use, or the next picture you attempt to take will suffer, as the slightest trace of it either on the hands or cloths, will produce a smear on the glass plate, which, although not seen at first, will show in developing, and cannot be removed.

TRIPOLI AND NITRIC ACID for cleaning the plates. **ALCOHOL AND VARNISH** complete the Chemicals for the Negative Process. The Solutions required are prepared from them, and the first is the

CLEANSING SOLUTION.

Directions for making this will be found at page 11, under the head Chemicals for Positive Process.

EXCITING BATH.

Dissolve—

Fused Nitrate of Silver.....	4 drachms.
Distilled Water.....	1 ounce.

and in another vessel—

Iodide of Potassium	1 grain.
Distilled Water.....	2 drachms.

When this is dissolved, pour it into the Silver Solution; the yellow Iodide of Silver which is at first formed is almost immediately re-dissolved. The theory of this is, that Iodide of Potassium precipitates Iodide of Silver, but Iodide of Silver is soluble in a very strong solution of Nitrate of Silver; hence it is so very quickly taken up again. Now add sufficient water to make up the quantity of eight ounces in all,—a fine precipitate of Iodide of Silver will be again formed, which, after standing a few hours, must be removed by filtration, and about 30 drops of Alcohol added.

Now test it with a piece of blue litmus paper, which should turn but slightly pink after it has been immersed about a minute, should it not do so, add a few drops of Acetic Acid until the desired effect is obtained.

DEVELOPING SOLUTION.

Pyrogallic Acid.....	6 grains.
Distilled Water.....	4 ounces.
Citric Acid.....	4 grains.
Alcohol.....	40 minims.

Dissolve the Pyrogallic Acid in water first, and afterwards add the Citric Acid and Alcohol.

In very warm weather, use rather less Pyrogallic Acid, and in cold weather, less Citric Acid. For landscape photography, substitute half a drachm of Glacial Acetic Acid, in place of the Citric Acid.

FIXING SOLUTION.

Hypo-Sulphite of Soda	4 ounces.
Soft Water	1 pint.

If these Solutions are made previously to commencing operations, and carefully placed away from dirt or dust, not only will the process be simplified, but the cause of many failures removed.

The Pyrogallic Solution will not keep good for more than a week or ten days, therefore a larger quantity than is required for immediate use, should not be made at one time.

MANIPULATION.*

CLEAN THE GLASSES

In the same manner as directed for the Positive Process, but remembering that the glass for this purpose must be really flat; it should therefore, be patent plate, or the Negative will assuredly be broken in the pressure frame: then proceed to

COAT IT WITH THE NEGATIVE COLLODION,

which ought to have been Iodized at least two days previously, and allowed to settle, when the clear portion should be decanted into a clean bottle for use. The Collodion coating is applied in the same manner as for Positives, and then

SENSITIZED

by immersing into the Nitrate Bath, prepared as directed at page 19. The plate should *not* be plunged into the silver solution immediately, but a few seconds in very warm weather, or half-a-minute or more in colder weather, must be allowed to enable the film to set, otherwise it will wash off the glass in the development. After the plate has been

* It is assumed that the operator is tolerably well skilled in the Positive Process; should that, however, not be the case, it will be necessary for him to read the article on Positive Manipulation, page 13.

plunged into the Silver Solution it becomes sensitive to light; therefore, this and the subsequent operations, must be performed in the operating or dark room. The plate should remain in the Exciting Bath from three to four minutes, during which time it must be raised once or twice to facilitate the removal of the oily appearance, *but on no account must it be lifted out of the solution until it has been immersed at least a minute.* When the surface of the Collodion film presents a nice even film, carefully drain off the excess of Silver Solution, and lay the glass plate in the dark side of the Camera and it is ready for

EXPOSURE.

Observing the same care as regards the management of the light as for Positives. After having exposed the plate for the necessary time, which, (other circumstances being equal,) will be about double that required for a Positive, proceed

TO DEVELOP.

The plate must be removed into the dark room, and the greatest care having been taken to exclude all white light, sufficient Developing Solution, (page 20) in a perfectly clean measure, is to be poured over the plate quick, but steadily; it must be done with great care, to prevent stains, and the solution may be diffused over the surface, more readily by gently blowing upon the glass, which also prevents any deposit from settling and spotting the picture.

As the Development of Negatives takes a much longer time than Positives, it will be found very convenient to have a stand to rest the plate on, called a Levelling Stand; the plate can remain here without fatigue to the operator; it should be repeatedly examined by holding a piece of white paper underneath, and if properly exposed, the development may be continued until the minor portion of the detail is visible, such as the shadows of a black coat. If the picture is not sufficiently intense, add to the solution you are using, two or three drops of the Bath Solution, but not until the picture is nearly developed; see Failures, section 27.

A good Negative, when held up to the light and viewed as a transparency, will be nearly opaque in those portions of the picture which are naturally white, such as the shirt front, &c., whilst the darkest shadows are nearly transparent.

A Negative that has been exposed too long in the Camera develops rapidly at first; the white portions of the drapery, the face, hands, &c., appear suddenly, these are quickly followed by the dark parts of the subject, which soon become equally opaque, presenting a uniform dull surface, and the half-tones or shadows are entirely lost; while an under exposed plate develops very slowly, the strong lights becoming particularly deep and intense, but the detail fails to make its appearance.

The conditions required for a good Negative are almost complete opacity

of the high lights, and as great a transparency as possible of the darks, still showing the shadows, &c. The greatest cause of failure in Negatives arises from under exposure and the want of sufficient development; this must be continued as long as possible, so as not to fog the picture.

When the Development has proceeded far enough, it is to be stopped by a stream of clear water poured over it, and which can be safely done by holding the plate perfectly flat, so as to prevent the water from penetrating between the film and the glass. Having done this, it is to be

FIXED

By immersion into a shallow pan containing the Hypo-Sulphite of Soda Solution, (page 20); or this may be poured over the plate, and the surplus returned to the bottle in the same manner as Collodion: which ever method is adopted, it must be allowed to remain until the yellow Iodide of Silver is completely removed, which will be the case in two or three minutes; at this point, daylight may be admitted into the room, and by so doing, it will be easier to discover when the Iodide is removed.

It now only remains to wash away all trace of the Chemicals used in fixing; which, if allowed to remain, would thoroughly spoil the picture,—too much care cannot be taken in this respect; afterwards, they are to be stood up to dry, and then varnished to protect them from accidents; when this is done, you may print from them any number of Positive copies on paper, without injury to the original.

There are so many Varnishes at the present time used for Negative pictures, that it is difficult to make a selection: in my own practice, I confine myself to two sorts—Amber dissolved in chloroform; or, French Spirit Varnish.

Amber Varnish is used cold, and is the best for an amateur to employ. The plate, after it is fixed, is allowed to dry either spontaneously or by artificial heat, (for which purpose a Spirit Lamp is extremely convenient); when the glass is *perfectly cold* the varnish is poured on the centre of the glass, and the superfluous quantity poured back into the bottle, in the same manner as directed for Collodion; in a few minutes the surface is dry, and may then be handled with impunity.

French Spirit Varnish gives a remarkably hard and permanent coating to the Negative, but the plate must previously be warmed until it is as hot as the hand can comfortably bear; the varnish is then poured over the surface and the drying completed by the application of more heat: there is practice required to do this simple operation nicely; if the glass is not sufficiently warmed the varnish dries dull, giving the appearance of ground glass, and if made too hot the spirit flows over the plate as if the surface were greasy, forming thick lines or bands across the picture.

When only a few copies are likely to be wanted, use Amber Varnish; but when a considerable number of proofs have to be printed, it is indispensable to use something much harder, and I know of nothing better than this article.

PRINTING PROCESS.

ON ALBUMENIZED PAPER.

The term Printing, simply means the forming Positive copies on prepared paper, from the Negative previously obtained, and is applicable for all descriptions of Negatives.

The plan of proceeding most generally adopted, has been to saturate a sheet of paper with a solution of an alkaline earth, allowing it to dry, and subsequently washing it with Nitrate of Silver, by which means the surface of the paper becomes covered with a chloride of that metal.

At this stage of the operation the paper possesses the property of turning black by exposure to the usual white or common light, but will retain its colour for a considerable time if kept in the dark; it is the possession of this property that renders it available for Photographic purposes; for example, take a sheet of sensitive paper, and lay a piece of net lace, or an engraving, on its surface and press them into close contact by means of a glass plate; now expose this to the rays of the sun, when almost immediately the paper begins to darken round the exposed parts, and in a few minutes becomes nearly black; but on removing the objects that have shaded the paper, it will be found almost white and unchanged, giving the outline of the net or object that had covered it; to render the paper further unchangable, it is necessary to fix the image, and we have a permanent impression.

The Apparatus necessary for the purpose, will be two or three shallow porcelain or glass pans, a glass rod, pressure frame, and some pins, or wood clips, to suspend the paper whilst drying.

CHEMICALS.

The Chemicals employed are Nitrate of Silver, Hypo-Sulphite of Soda, Chloride of Gold, Citric Acid, Carbonate of Soda, and Washed Kaolin; also procure some even grained Albumenized Paper. This paper can be purchased ready albumenized fit for immediate use; and, as there are many difficulties in its preparation, it will be found better to procure it than to risk the success of the future operations by attempting the manufacture.

These Chemicals are for the purpose of preparing the three solutions required.

EXCITING BATH.

Make a solution of

Nitrate of Silver	60 grains.
Distilled Water.....	1 ounce.

This solution may be made up in any quantity and preserved for use. It is advisable to add a drachm of Kaolin to every three or four ounces, for a reason to be presently noticed.

TONING BATH.

This is composed of two solutions, which may be made up in quantity but not mixed together until the time they are required for use.

The first solution we will, for convenience, call *Citrate of Soda Solution*.

Carbonate of Soda	30 grains.
Soft, or Distilled Water	1 pint.
Citric Acid.....	12 grains.

It will be apparent that when the Soda is dissolved this solution will be alkaline, and would restore the blue colour to a piece of red Litmus Paper,* but by adding the Citric Acid it become neutralized; it is advisable to test it with both blue and red Litmus Paper, to insure that it is in this condition: if it is found that the red Litmus immediately becomes blue, add a trifle more Citric Acid; should it, however, turn a piece of blue paper to a pink tint, add more soda. It should, however, be left slightly alkaline, which is shown by the red paper having a slight tendency to turn blue.

In another vessel prepare the *Chloride of Gold Solution*.†

Chloride of Gold	4 grains.
Distilled Water	1 ounce.

These solutions are mixed together a short time previous to use, in the proportion of $\frac{1}{2}$ -ounce of Gold Solution to $\frac{1}{2}$ -pint of Citrate of Soda Solution, as will be described when we come to the manipulation.

FIXING SOLUTION.

Dissolve—

Hypo-Sulphite of Soda	4 ounces.
Soft, or Distilled Water	1 pint.

MANIPULATION.

When the solutions that are required are all prepared, select a sheet of albumenized paper suitable for the description of picture you purpose to print. Various papers are now employed; I recommend one of these three—*PAPIER SAXE*, *PAPIER RIVE*, *CANSON'S THIN*. If for large portraits, or copies of large pictures or landscapes, use *Papier Saxe* slightly albumenized. For general purposes, such as medium size portraits or views, *Papier Rive* is well suited; there is more certainty of producing a satisfactory tone, and this paper generally has a finer or more highly albumenized surface than the thick *Papier Saxe*.

Stereoscopic pictures, or copies of small fine engravings, should be printed on *Canson's Thin Paper*. The stereoscope magnifies the surface to

* Blue Litmus Paper may be converted into red by holding it in the vapour of Glacial Acetic Acid for a few minutes.

† The Chloride of Gold Solution obtained from my establishment is prepared of this strength.

such an extent that unless it is very highly albumenized it appears rough and coarse; besides, the difficulty of mounting thick paper on the card mounts is very considerable.

The first operation is to

EXCITE THE PAPER.

Filter sufficient of the Nitrate of Silver Solution into a shallow glass or porcelain* pan to cover the bottom to the depth of half-an-inch. Then take a sheet of paper cut to the required size, and holding the two ends by both hands, let the centre drop until the albumenized surface touches the solution, then carefully lower the two ends and leave the paper floating on the bath—if this is done slowly and with ordinary care, the air bubbles which might have formed underneath will be expelled; the back of the paper must be kept perfectly dry.

The time required for the silver to act on the chloride in the paper will be about three minutes, but give it time enough; generally when it lays flat and the ends cease to curl up it may be considered to be fully saturated and should be removed by lifting one corner with a pair of forceps and hung on a line to dry, either by means of pins previously coated with varnish to protect them from corrosion, or with American wood clips. All this portion of the manipulation should be done in the dark room, as the paper is sensitive to white light.

The Silver Solution will excite almost any number of papers, with a little attention, but it soon discolours by the action of the albumen, therefore keep a small portion of Kaolin in the bottom of the bottle, and after each day's work is done shake it well up; when it has had time to settle and the top portion is filtered for use, it will be found bright and clear.

The Exciting Bath should be occasionally tested with a Bath Tester, to ascertain that it is of the proper strength; this instrument is made in several ways, but one in the form and on the principle of an Hydrometer is sufficiently exact for this purpose; they are divided up the stem from 0° to 70° and show the number of grains of silver to the ounce of water, by the degree at which they float: thus, in plain water the surface of the liquid cuts the scale at 0, but when there are 30 grains of silver in the ounce of water the scale floats at 30, so in proportion for other points.

The sheet of albumenized paper when thoroughly dry may be at once passed on to the next stage of operation, or, if more convenient, it may be kept in a portfolio, or book, for ten or twelve hours.

PRINTING THE POSITIVE.

Take a pressure frame (*fig. 14*) into the dark room, and remove the back board, then lay the Negative on the plate glass of the frame, with the

* If porcelain pans are used they must strictly be kept to the same solutions, as the glaze soon cracks, and they imbibe the chemicals; Gutta Percha trays are convenient, but if dirty they are not so readily detected.

Collodion side upwards, and cover it with a piece of sensitive paper, prepared side next the Negative; replace the back board, and bring them into close contact by closing the crossbars; now turn up the frame, and expose to the direct light of the sun.

In order to determine the time of exposure, the print may be examined during the process (by removing half the back board); but the proof should be allowed to obtain a tint a few shades darker than you intend it to remain, as it loses colour in the fixing process. When the desired strength of picture is obtained, return the pressure frame to the dark room, and remove the paper, which is still sensitive to light.

TONING PROCESS.

The motive for toning the picture previous to fixing it, is twofold:—First, the colour it now presents is anything but artistic, or desirable; and secondly, toning is a great preservative, giving to the print a permanence, without which it is nearly valueless.

I prepare the Toning Bath according to a modification of the process lately introduced by Mr. Hardwick. Having mixed the Chloride of Gold Solution and the Citrate of Soda Solution together (page 24) in a shallow dish, immerse the picture in a vessel of soft water, and well wash it for a few minutes to remove the superfluous silver that remains in the paper; then plunge the paper into the Toning Bath, and keep it under the surface of the Solution by means of a glass rod.

In a few minutes the desired tone is produced, when it is to be again washed in water, and removed to the Fixing Process, which is the last operation. The length of time the print will take to tone, depends on the temperature of the operating room, and the strength of the bath; if it is new and rich in gold, it will attain a good purple black in about five minutes, but if the gold has been partially worked out of the solution, double that time will be required.

The final operation, after washing the remaining trace of toning solution out of the paper, is to proceed with

FIXING THE PRINT,

using the Hypo-Sulphite of Soda solution described at page 24. The picture is immersed in this for about five minutes and then again washed in *running* water for ten minutes or a quarter of an hour, after which it may be left soaking in fresh waters constantly changed for ten or twelve hours; it is preferable to leave it in a vessel of water under a tap, which is constantly dripping.

The Fixing Solution will reduce the depth of the print very considerably, therefore it must be over-printed in the first instance to allow for this reduction, else the detail of the picture will be lost.

The Fixing Solution *must be new*; that is, after a number of pictures have been fixed it should be thrown away, not because it ceases to perform its

work, but because the sulphur which is liberated from the soda acts upon the paper and will cause the ultimate destruction of the photograph; half a pint of solution is capable of fixing about three dozen pictures six inches by five inches, after which it ought to be discarded and a fresh bath made.

MOUNTING PRINTS.

This final operation requires care, or the previous pains bestowed on the proof will be thrown away.

Dextrine appears to be the most suitable of all adhesive substances for attaching the picture to the mounting board; it is prepared by mixing a small quantity, say an ounce, with sufficient water to work into a stiff paste, then rapidly pour about a pint of *boiling* water over it, continually stirring to insure perfect mixing; it is advisable to boil it if there is any doubt about sufficient heat being obtained, or where small quantities are prepared. It should not be used much thicker than cream, and must be freshly made, for when it becomes sour there is danger of its causing the print to fade.

Use stout cardboard, and if it is intended to leave a margin round the picture, let it be of a buff or yellow colour; at all events do not use that with a blue tinge as it spoils the tone of the photograph. The surface of the cardboard should be slightly dampened with a moist sponge to cause it to expand, and the Dextrine applied to the back of the picture with a moderate size brush, then carefully lower the print, and lay a piece of clean blotting paper over the face of it, then rub pretty strongly with a cloth to expel the air bubbles and insure contact; when nearly dry, place under pressure for a few hours.

—o—

If *Auro-Chloride of Sodium* is used for toning, the Bath is prepared in the following manner:—

Soft Water	1 pint.
Carbonate of Soda	20 grains.
Auro-Chloride of Sodium.....	15 grains.

The manipulation is precisely the same as when Chloride of Gold is employed, but this solution has the advantage of keeping longer than when made with Citrate of Soda.

FAILURES: THEIR CAUSES AND REMEDIES.

—o—

POSITIVE AND NEGATIVE COLLODION PROCESS.

In enumerating the different obstacles that present themselves to a beginner, the first that demands our attention is that resulting from not properly cleaning the glass plates, and the specks of dust, &c., that settle on them; they must always be dusted the last thing before the Collodion is applied: nothing for this purpose is equal to the India-rubber bellows; but it will be better not to clean the glasses in the same room as you coat the plates, as the dust which floats in the air is the principal cause of the black specks so often complained of.

1. In using Collodion, it should be borne in mind, that the object is to obtain an even film. The general fault of beginners is to hurry this part of the operation, thinking it essential to prevent the evaporation; but it is better to take time and do it leisurely, for should the Collodion become too thick towards the end of the bottle, it may readily be thinned by the addition of a little Ether.

2. Another cause of failure results from small pieces of dried Collodion that hang about the neck of the bottle, floating over the plate; this is easily to be avoided, by carefully wiping the bottle every time before using it.

3. The other difficulty, which is the sediment of Collodion, occasions more trouble; all Collodion, after standing a few hours leaves a deposit, called bottoms; and the only precaution that can be taken is, to have a large bottle kept full, holding from four ounces to a pound, according to the quantity consumed, and when required for use, an ounce or so, carefully poured off into a smaller bottle. Long bottles (*fig. 17*) with a lip and stopper, made expressly for this purpose, can be obtained, from one and sixpence to two shillings each, and will be found extremely useful.

4. The Collodion, especially in coating large glasses, must be poured on to the extreme end of the plate, and allowed to flow in one continuous wave towards the end it is held by, or there will be a double thickness or band in the film across the plate.

5. If the plate is immersed into the bath too soon after it has been coated with Collodion, or before the film has had time to set, a number of streaks or lines are formed up and down the plate; the same defect will arise if the plate is lifted out of the bath too soon, or before the solution has become incorporated with the film.

6. The Collodion is apt to peel off the plate unless the Collodion is allowed time to set; this fault is more apparent in developing a Negative

than in a Positive, in consequence of the greater length of time required in the manipulation, whereby the film is apt to become loosened and wash away; one cause of this is bad Collodion, but with the very best sample the film will not adhere if the plate has been plunged into the bath too quickly. The edges of the glass should be roughened or ground, which materially assists in preventing this chance of failure; adamantine files are made for this purpose, and are extremely convenient.

7. On the other hand, if the plate is kept too long before it is immersed into the bath, the picture will be covered with a number of small wavy marks like bad writing.

8. The plate, after being removed from the bath, should be exposed in the Camera without loss of time, for if the film gets dry, it loses its sensibility; it also must be developed without unnecessary delay.

9. Fogging the plate is the greatest difficulty the amateur will have to contend with, which arises from the following causes: *over exposure of the plate*; the effect of *diffused light*; or *impurity of the bath*; and resembles a thin veil or deposit over the whole picture.

10. The first mistake is easily remedied by trying various times of exposure; but if the transparency of the shadows cannot be maintained when the minimum of time has been allowed the plate in the Camera, the fault must arise from one of the other causes.

11. The effect of diffused light is more difficult to determine; the readiest way will be to first thoroughly examine your Camera, and observe that the sliding shutter and the door of the dark frame fit perfectly tight. (It will be advisable to cover the Camera with a dark cloth when you have a plate in it, and raise the shutter by placing the hand underneath it.) If this seems sound, the fault may be in the developing room; one fold of yellow calico over the window is not sufficient to prevent the admission of the chemical rays, moreover, the calico loses its colour, and in time becomes perfectly useless by exposure to the light. If, after these precautions, the pictures still fog, it may be owing to too much light entering the front of the Lens. As far as possible the Camera should be kept in the dark, or the hood of the Lens must be shaded while the cap is removed.

12. A very simple means of determining if the fault is in the Apparatus or in the Chemicals, is to coat, sensitize, and develop a Collodion plate without leaving the dark room; after it has been removed from the bath pour on the Developing Solution, then wash it off, and remove the Iodide of Silver by the aid of the Fixing Solution. The plate should now appear clear and transparent: if that is the case, the Chemicals are in good condition, and the fogging must arise from solarization in the Camera; on the other hand, if the Cyanide Solution fails to remove the film of Iodide, or leaves the plate covered with greyish spots, (and you are certain the diffused light has been excluded from the operating room,) the only possible cause must be impurity of the bath.

13. For Positives the bath must contain a small portion of Free Acid; therefore, if it will not produce a clear picture, and you are satisfied it does

not arise from solarization, immerse into the solution a small piece of Litmus Paper, which should gradually change from a pale blue to a deep pink tint : if it does not do so, after a minute or two, add a drop of dilute Nitric Acid, or more, until the desired effect is obtained.

14. For Negatives the bath ought to be nearly neutral, or very faintly acid ; the bath made as described at page 19, will generally be in a proper condition to work well ; if, however, there is any doubt about the condition it is in, test it with litmus paper, and should it not turn the blue colour of the paper to a slight pink, add a drop or two of Acetic Acid. If the bath is too acid, which is shown by the paper assuming a deep scarlet, it will be impossible to obtain density sufficient to make a good Printing Negative.

15. The remedy for a bath which is too acid is to add to the Silver Solution a small quantity of pure Carbonate of Soda, until no more will dissolve, when it must be filtered and again tested with the litmus paper : it will now be found rather alkaline, as shown by no change of colour in the litmus paper ; a drop or two of Acetic Acid will remedy this, and the bath will be ready for use ; but after it has been corrected, it is advisable to allow it to have a day's rest before working it.

16. There is also another cause that prevents either a Positive or Negative bath from giving a clear picture, and arises from its becoming saturated with Ether ; this is a very common fault with baths that have been in use for a long time ; the only way of correcting this will be to pour the solution into a shallow pan and expose it to the air for a few days ; if in the full glare of the sun it will do no harm.

17. Streaks, or stains, are generally observed whilst developing the picture. To attempt to describe all that sometimes make their appearance, would be an endless job ; but those most frequently met with are readily distinguished and avoided.

18. If the Developer has not been poured over the plate with a regular steady flow, there will inevitably be formed a line or curling mark where its progress has been arrested, something resembling a crack or a hair across the film.

19. The most common cause of stains arise from the wet and sloppy state careless operators keep the dark slide of their Cameras in ; new wood, unless well varnished, is almost sure to cause a deep stain on the corners of the plate next the carrier ; for this reason, in the best Cameras the corners are furnished with a silver wire, and the wood (mahogany) is varnished. The remedy for this annoyance is, obviously, to wipe the drainings of the plate-holder each time it is used ; and if common Cameras are employed with bone, gutta percha, or wood corners to the carriers, give them a good coat of black jet varnish.

20. An excess of Alcohol in the Positive Developing Solution spoils the tone of the picture, and makes it dead and flat ; under no circumstances should the quantity directed at page 12 be exceeded ; its only use is to make the solution flow more evenly over the plate, but a clever operator might reduce the proportion very considerably with advantage.

21 Should there be too much Acid in the Positive Developer, the half tones of the pictures, such as the shadows of the darker portions of the coat, will be extremely difficult to obtain. An excess of Nitric Acid will cause the picture to have a very strong metallic appearance, as if the Silver were deposited in a number of small crystals.

22. An excess of Acid in the Negative Developer, prevents the deposit from becoming dense enough to form a satisfactory picture, much the same as if the bath were too acid. (Section 14.)

23. When the Developer is weak in acid, a deposit is formed in the shadows, producing a general fogging of the plate, similar to diffused light. (Section 11.)

24. Assuming that the chemicals are in proper working order, and the apparatus is sound and free from the intrusion of stray or dispersed rays of light, the time allowed for the exposure of the plate requires the most careful attention. A Positive picture, if correctly timed, presents the most beautiful gradations of tone that can be desired; hold it up to the light, and look through it at the sky, or some light object, you will perceive that the deep shadows, (that is, the dark parts of the dress) are nearly, if not quite transparent, the folds in the drapery are shown by a slight deposit of silver, while the face, hands, and white drapery, have considerably more opacity; but if the picture is laid on a piece of black velvet, the apparently opaque, or black portions of the picture, will show a clear and beautiful white from the reflection of the deposited silver; while the transparent portions of the plate allow the black colour of the velvet to show through, and makes the contrast of the picture. Now, if the plate has been over exposed in the Camera, there will be a general deposit, or fog, over the whole of the picture, quite sufficient to prevent the blacks from having the depths they ought to have. The under exposure of the plate, on the other hand, fails to bring sufficient deposit to the shadows of the picture, and nothing will be visible, except the strong lights, such as the face and hands; the portrait, moreover, has a sombre gloomy appearance.

25. The remarks made (section 24), relative to the exposure of Positive pictures, apply in a similar manner to Negatives, with this proviso, that they are only to be looked at as a transparency; when viewed in this manner the blacks, or shadows, ought to be nearly, if not *quite, transparent*, while the lighter portions of the subject must be as nearly opaque. (I find there are few persons who really know a fine Negative when they see it, except, of course, Professional Photographers, who have devoted their principal time to the production of these pictures). Now, between the perfect transparency of the shadows, and the complete opacity of the high lights, there are many gradations, which come under the general term, *half tone*. If the plate has been over exposed, the whole of the picture starts out almost immediately the Developer is poured on the plate; and long before the desired opacity of the high lights is obtained, there is a general fog over the surface, and the deep shadows do not present that clearness which is indispensable. If the plate has not been exposed sufficiently long

in the Camera, the picture is tardy in making itself at all visible ; and develop as long as you will, nothing else will be seen except those more fortunate portions of the sitter which happen to have great illumination.

26. Always use a clean measure for the Negative Developing Solution, and wash it out with clean water after each picture has been taken ; this precaution is not necessary with the Positive Developer, as the portion remaining is not discoloured in consequence of the superfluous quantity poured on the plate being thrown away.

27. There often arises a difficulty in getting sufficient intensity in a Negative, even when the greatest pains are taken to keep the Developer and Bath in proper order ; this may be caused by the want of actinic action in the light, or a peculiarity in the Collodion or Bath, it therefore is occasionally necessary to resort to some method of intensifying a Negative, and by a similar plan (under favourable circumstances) an over-exposed Positive can be converted.

There are several methods commonly practised, the first I shall notice is more strictly a portion of the ordinary developing process, and has been referred to at page 21. When the Negative Developer has been poured over the plate, and the first trace of the picture is seen, tilt the glass so as to drain the solution back into the measure ; now a second time pour this same Developer over the plate, and in a short time the greatest amount of density which the chemicals in their present state are capable of giving will be obtained ; it is essential that a small portion of Nitrate of Silver is present on the Collodion film, else the pyrogallic acid will not cause sufficient deposit ; therefore it is sometimes necessary to add to the Developer a few drops of the Bath Solution, which will have the desired effect. The silver must not be used until the picture has made its appearance, and should be put into the measure, not mixed on the plate.

An over-exposed Positive may often be converted into a suitable Negative by pouring over the surface a solution similar to the Negative Developer (page 20), to a drachm of which two or three drops of Bath Solution has been added, this must be applied immediately after the picture has been fixed and washed ; the Pyrogallic and Silver rapidly discolours, but if kept in motion by being repeatedly poured off and on the plate, it will occasion no harm ; when the requisite density is obtained simply wash with water, and when dry varnish as usual.

Hydro-Sulphide of Ammonia is a more energetic intensifying agent, but is objectionable on account of the unpleasant smell which arises from it ; it is used in the same manner as the Pyrogallic Acid and Silver just described : the proportions I use are fifteen drops to the ounce of water.

28. Blue stains are caused by not sufficiently washing the plate after the development, and results from the Cyanide of Potassium in the fixing Solution mixing with the iron, and producing a deposit of Prussian Blue on the picture. If the Cyanide of Potassium is used too strong, it will destroy the film, and eat into the picture ; it also must be well removed from the

plate, by careful washing after it has done its work, or the image will discolour very much in drying, the whites changing to a dirty brown.

29. The Hypo-sulphite of Soda used for fixing the Negatives, also requires attention; it must be occasionally filtered, and if not removed from the plate by a copious washing, will crystallize as the film dries, spoiling the picture.

PRINTING PROCESS.

30. The general failures that arise in Printing Positive copies on paper from glass Negatives may be classed under two heads, viz. :—those that arise from imperfections in the Negative, and others which are to some extent inseparable from the process itself, except at the expense of extraordinary vigilance.

31. The number of spots and stains which are sometimes found in paper proofs arise from carelessness—such as touching the paper with dirty fingers, or using old or discoloured solutions for exciting; and often failures in this manner arise in ways which are apparently unaccountable, such as employing dishes for one chemical that have been previously used for others, but more often the fault may be traced to old and worn out solutions.

32. Impurity of the whites and general dinginess of tone is a fault which arises from delay in toning, or fixing, soon after the picture has been printed, and bad colour is produced by not properly timing the process; it is impossible to get a good purple tone unless the print is slightly over printed; the best way of becoming efficient on this point is to print three pictures at the same time to different depths, and then toning them altogether, you will thus at once ascertain the relative depth it is advisable to go to.

33. The Silver Solution on which the paper is excited must be of the strength of 60 grains to the ounce, else the picture will appear poor; the only exception to this rule is in the case of very thin or weak Negatives, these sometimes produce better proofs when the paper is not so highly excited.

34. If a number of prints are toned at one time in the same dish, take especial care that they are kept covered with the solution, and likewise that they are not allowed to remain long in contact with each other.

STEREOSCOPIC PICTURES.

The Stereoscope furnishes the means of viewing objects in their natural positions as regards solidity, &c. ; and is the only requisite to make Photographic Pictures the exact models of life.

The Pictures for the Stereoscope consist of two views of the same object, taken from different points of sight, in the same manner as the subject is viewed by the two eyes. These two pictures are then placed in the Stereoscope, where the sight is so concentrated upon them that the mind only realizes one picture, which presents the solid appearance and gives the charm to these beautiful productions.

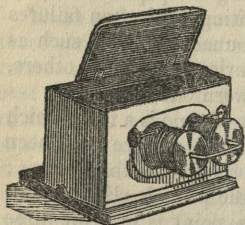


Fig. 24.

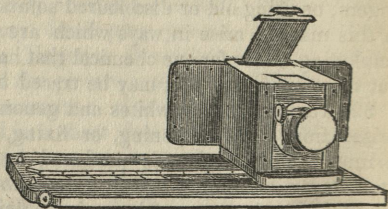


Fig. 25.

There are two forms of Stereoscopic Cameras,—the Twin Lens or Binocular Camera (*fig. 24*), and the Single Lens Camera (*fig. 25*.)

The Binocular Camera takes both pictures at one operation, and for portraiture is perhaps the best, as there is not the same liability to spoil the picture, by the sitter moving during the exposure, as when a Single Lens Camera is employed.

To use a Double Lens Camera, you coat the plate in the usual manner, and place it in the dark slide: then focus the sitter by each Lens, taking especial care that a really sharp definition is obtained on the ground glass; now insert the dark slide, and when all is ready, remove both caps from the Lenses at the same time; when the plate has had the necessary exposure, remove to the dark room and finish the manipulation.

If the intention has been to produce a Positive glass picture, it will simply require mounting, which is done by inserting it into a Passe-partout; but previous to doing this, the plate must be cut in half across the centre and the picture transposed, so that the left hand picture be put to the right hand of the other, else a very remarkable pseudo-scopic effect is produced, the distant objects appearing in front of those in the foreground.

When Paper Copies are required, the Negative is first produced on glass, from which the proof is afterwards printed; in mounting them the same precaution must be taken to transpose the pictures as just mentioned.

With a Single Lens Camera on a sliding bar, similar to Latimer Clark's principle, there is no necessity to transpose the pictures, as that object is effected by the arrangement of the apparatus: it consists of a Camera (*fig. 25*) of the ordinary construction mounted on a board about fifteen inches long and six inches wide, the Camera slides along a lath, which is so fixed on this board as to allow it to have a slight angular motion; the dark slide which holds the prepared plate is made sufficiently large to carry a glass on which the two pictures are taken; it also has a sliding groove to bring successively the different portions of the plate behind the Lens to receive the Photographic impression.

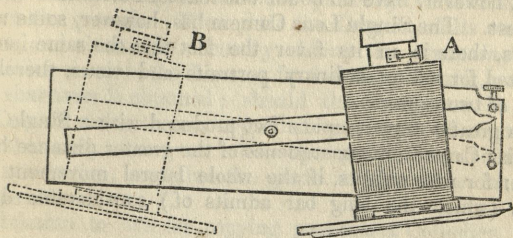


Fig. 26.

Fig. 26 will facilitate the explanation which is required to use a Camera of this construction: it will be apparent that the Camera not only slides along the bar, but the bar also has an angular motion, it turning on a pivot in the centre of the board; at the extreme right are two small studs, the distance between which is regulated by a screw turned by a milled head. When the Camera is placed at the extreme right, or in the position A, the bar has an inclination given to it to point the Camera to an object situated in the centre; now, were this bar fixed or rigid when the Camera is pushed to the further extremity a distance of ten or twelve inches, it is evident that different objects would be under these circumstances thrown upon the ground glass, therefore the bar is slightly turned on its axis to bring the Camera into the position shown by the dotted lines at B, the amount of convergence being regulated by the operator fixing the studs at the time the focus is obtained. To take a picture by this apparatus, you first place the Camera in the position A, and focus the sitter by the ordinary means, observing the position of the image on the ground glass by the aid of some parallel lines which ought to be ruled across the plate. Now slide the Camera along the bar into the position B, and observe if the same object comes into the same part of the field as it occupied previously; should it not do so, either the Camera has too much or too little angular motion, therefore move the bar on its centre until the desired point is obtained: then shift the stop or stud until it touches the bar, and all is ready.

The plate having been sensitized and placed in the dark slide, remove the focussing screen from the Camera, and place the dark slide in its

place, with the sliding frame pushed to its extreme left, the Camera remaining in its position at B. Now raise the shutter and remove the cap of the lens; when the proper exposure has been given to the plate replace the cap, and slip the Camera along the bar into the same position it previously occupied at A. Then slide the plate-holder along the groove at the back, in order to bring that portion of the Collodionized glass which is to receive the impression behind the lens. Again remove the cap from the lens, and when the second picture has been exposed the necessary time, remove the dark slide to the operating room and develop the plate.

There is much difference of opinion respecting the merits of these two Cameras; I, however, have no doubt but that for Portraiture the Binocular Camera is best. The Single Lens Camera has, however, some advantages: among others, there is in its favor the fact that the same instrument is readily adapted for taking ordinary portraits and views, thereby avoiding the expense of two cameras.

There is a greater stereoscopic effect produced with a Single Lens than by a Binocular Camera, in consequence of the greater distance between the two stations; for near objects, if the whole lateral movement is given to the Camera (which the long bar admits of,) considerable distortion is produced.

COPYING PICTURES.

The Lens best adapted for copying pictures or engravings, is the Achromatic Triplet; it entirely avoids distortion and copies sharp up to the edges of the plate. In default of this, use a Single Achromatic Lens with a stop in front, or an ordinary Portrait combination with a diaphragm between the Lenses.

The principle which regulates the size or scale on which the copy is produced is this: the closer the original print is brought to the lens, the larger will be the image produced on the ground glass, therefore it is only essential that the picture to be copied is suspended at a proper distance from the lens, and any size may be produced, but the Camera must be made much longer than usual, for the focus of the lens increases very rapidly as the object to be copied is brought nearer to the instrument; it will be convenient to first fully understand the natural property of refracted light, which is termed "conjugate focus."

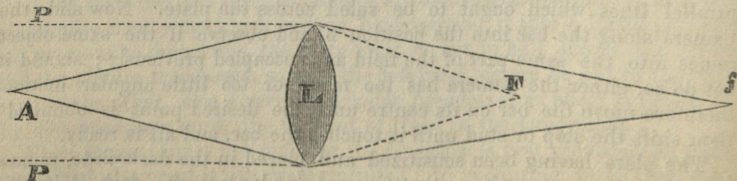


Fig. 27.

In the Diagram (*fig. 27*) the dotted lines, *P*, represent parallel rays of light from an object at an infinite distance, falling upon a Convex Lens, *L*, where they are refracted and come to a point at *F*, which may be termed the principal focus; when the rays proceed from a nearer object, as *A*, they will not converge so quickly after passing the Lens as in the former case, but will be carried on to *f*, which then becomes the focal point; therefore *A f* are conjugate foci, for if we consider *f* to represent the point at which the object to be copied is fixed, then *A* will represent the focus, precisely as *f* is the focus of an object at *A*.

In copying photographs or engravings, they should be fixed against a dark wall or background and fastened perfectly vertical at a convenient height from the ground. Then place the Camera on its stand in front of the picture, and obtain the focus *by sliding the expanding body of the Camera*, either closer to the Lens or further away from it, until the proper degree of sharpness is obtained; should the image not be large enough, take the Camera closer to your copy; if too large, of course it must be moved further away; however, when this preliminary point is settled to complete satisfaction, sensitize the plate in the same manner as for an ordinary picture.

It is advisable to use for copying purposes a Collodion that has been Iodized for some considerable time, and allowing it a proportionate length of exposure.

If a Negative is required, substitute half a drachm of Glacial Acetic Acid for the Citric Acid in the Developer, at page 20.

Should the original copy be covered with a glass it ought to be removed, or there may be a considerable reflection of diffused light into the Lens.

If a Portrait Combination Lens is being used and it is required to produce an enlarged copy, the whole of the Lenses, mounting and all, must be reversed, so that the Lens (*D*, *fig. 5*) is outside and the Lens *B* inside the Camera or next the sensitive plate; in using a Single Achromatic Lens it also will require to be turned in its cell when enlarging, so as to place the flattest surface inside the Camera. The Triplet Lens being symmetrical, does not require any alteration to be made in its arrangement, as it is immaterial which is considered the back and which the front Lens.

PORTRAITS ON METAL PLATES, LEATHER, &c.

Portraits are often taken on metal plates instead of on glass, especially when required for mounting in brooches, locketts or rings, as it can be readily cut with a pair of scissors to the required shape; these plates will not require cleaning previous to use, if they have not been soiled with the hands. They are coated with Collodion, excited, and developed in the same manner as glass Positives; the only difference to be noted is, that in laying the plate in the dark slide, place a plain glass over the back previous to closing the door, or the force of the spring will bend the plate. Should the pic-

ture not appear worth keeping after it has been fixed, wash it off immediately, and the plate may be cleaned with a small pellet of cotton wool and alcohol, gently rubbing the surface with a circular motion.

American Niello Paper is an article that has been introduced lately with great satisfaction for the same purpose; it possesses a superior surface to the Iron Tablets, being much more even and free from spots or grit; it is used thus, select a glass plate, either the same size or a trifle larger, and slightly wet it with Alcohol or water, lay the paper carefully down on this and it readily adheres to the glass plate; when the plate has somewhat dried, clean the paper by rubbing it lightly with a small piece of cotton wool moistened with water and fine tripoli, then polish with a wash leather.

The Collodion is now floated over the surface, and if the glass is larger than the paper there is no objection to the Collodion running completely over both, as the film helps to prevent the bath from penetrating between them. The rest of the manipulation is precisely the same as for glass plates. It is advisable for these pictures and for those on Iron Tablets to use a Collodion rather thick and highly Iodized, therefore make a mixture of equal parts of Positive and Negative Collodion.

Collodion Positives may be transferred to glazed linen or cloth very readily. You first take a Positive on glass, in the usual manner, and after it has been fixed and thoroughly washed, dry it, either by holding before a fire, or any other convenient manner; then when the plate is quite cold, cover the surface with alcohol, to which a few drops of Nitric Acid have been added, (say in the proportion of three drops of acid to the ounce of spirit), and while still wet, lay the cloth gently over this, pressing it into close contact, and excluding the superfluous moisture and air bubbles; let it remain in this state for two or three hours, or until dry, when it may be lifted off the glass, bringing the film with it.

American Muslin has an advantage over the English Transfer Cloth, arising from the smoothness and brilliancy of the surface; it is used precisely in the same manner but the results are far superior.

I have succeeded better in this process by using a Negative Collodion instead of Positive, as the film is much tougher, and will bear handling to a far greater extent; of course it must be developed with the usual Positive Developing Solution, page 12, but the tone of the picture will not be as good as if Positive Collodion were employed. After the picture is fixed and washed, clear away the edges of the film, previous to drying it, or they will be transferred to the cloth, and give a very untidy appearance.

ALABASTRINE PROCESS.

The peculiarity of this process consists in re-developing or toning the Positive Collodion picture after it has been fixed with Cyanide of Potassium, in order to increase the intensity of the image; until recently there has

been a difficulty experienced in preserving these pictures, but now, by means of a suitable varnish prepared for the purpose, they are said to be as unalterable by the action of the atmosphere as any other photograph.

The Alabastrine process likewise gives the means of preserving the sitter in a natural position, as by the aid of a penetrating varnish, the colour is thrown through the picture; or, in other words, is made to penetrate the film, so that the glass plate may be mounted in its frame or case with the Collodion side downwards, thus showing the figure non-reversed, as is the case with other Collodion Positives; when this plan is adopted they are termed *Chromo-Photographs*.

The same Bath, Collodion, Developing, and Fixing Solution, is used as for an ordinary Positive, but after the picture has been well washed, to remove the cyanide of potassium or fixing solution, proceed to tone it; for this purpose, place the glass plate on a levelling stand face upwards, and pour sufficient of the Alabastrine Solution* over the plate to perfectly cover it, the image immediately becomes very dark, and almost disappears, it however rapidly undergoes a complete chemical change, and in the space of a few minutes the whites begin to recover their original colour and intensity; let this proceed for a short time longer, until all trace of the discolorization which ensued when the solution was first poured on, has disappeared; the superfluous solution is then to be thrown away, the plate drained and well washed with a stream of running water, and afterwards dried; the pearly whiteness of the picture will rapidly tarnish if it is not protected by a suitable varnish, which operation is performed by pouring the varnish over the surface in the usual manner, first gently warming the glass, and finally, drying it by the aid of increased heat.†

The picture best adapted for this purpose is one that has not been overexposed in the Camera, as it is essential that the image is sharp and the shadows clear from fog or deposit.

The re-developing solution is to be poured over the plate whilst it is still wet—that is, immediately the fixing solution has been washed off; there is no occasion to perform this operation in the dark room, but take especial care that the whole of the chemicals are removed with running water.

If the operator's intention is to produce a *Chromo-Photograph*, the Alabastrine picture must be coloured with dry powder colour and the penetrating varnish afterwards flooded over the plate.

* The Alabastrine Solution is sold ready prepared for use in bottles, containing four ounces, at 1s. each, 10 ounce bottles 2s. each.

† A suitable varnish can be obtained for these pictures, and it is imperative that such is the case; as all Spirit, and most Benzole or Chloroform preparations, lower the white, and generally discolour the Alabastrine Picture.

VIGNETTE PORTRAITS.

Photographs produced in the Vignette form have for some time been extremely popular; there is no particular difficulty in their production, all that is requisite is the possession, and proper use of a Vignette Glass, which is a sheet of yellow flashed glass, the coloured surface of which has been worked away, leaving a clear disc; they are made of two descriptions either for paper pictures or for glass Positives.

VIGNETTING PAPER PRINTS.

The glass used for this purpose is one with a transparent centre and yellow round the edges; thus, when laid on a sheet of sensitized paper it allows the central portion to become darkened by the light, but the edges retain their original purity, being secured from actinic light by the yellow tone of the glass.

To produce a Paper Vignette Photograph, you use a Negative taken in the usual manner as directed at page 17; this is laid in the pressure frame in the front of a piece of sensitized paper, the same as if for an ordinary print, but outside the glass of the printing frame; the vignette glass is placed in such a manner that the head of the subject comes into the central space; it is at once evident that the printing of the picture will proceed in the centre the same as usual, but round the edges the deep colour of the vignette glass prevents chemical decomposition; therefore, when the print is removed from the frame the margin is as white as when first sensitized.

VIGNETTING GLASS POSITIVES.

The Positive Vignette Glass is the reverse of that just described, being opaque in the centre and transparent round the edges: after a glass Positive has been exposed in the Camera, but not developed, this glass is laid over it and the whole exposed to diffused day-light, by which means the margin of the picture is solarized, while the central portion is protected by the yellow colour of the glass; therefore on applying the Developing Solution the solarized portions of the plate are left pure white and the head of the subject is merely produced.

The practical method of using these glasses is this: after giving the plate the necessary exposure in the camera, return to the operating room and insert the vignette glass into the dark slide, now open the door of the room and allow the diffused light to fall for a second or two on the plate; then close the door and develop the picture. A few trials will show the necessary amount of solarization which it is desirable to give; if carried too far the fogging will proceed all over the plate, and if not sufficiently exposed to the light, the vignette effect will not be produced at all, but the picture will develop in the usual manner.

COLOURING PHOTOGRAPHS.

Colouring Photographic Pictures does not absolutely require a professional Artist; the outlines, &c., being already furnished, they are to be tinted by means of a little dry powder colour.

The best Colours for this purpose are those prepared by Messrs. Newman; they are very finely ground, and afterwards prepared to make them adhere to the glass plate.

The Brushes are to be of the best quality, or they will spread unevenly over the picture; about three sizes will be required, made either of Camel's Hair, Goat's Hair, or Sable; they are, previous to commencing, to be pointed, by just dipping them in a vessel of water, and shaking or rolling them between the hands, so giving them a very fine point, on which the colour is taken up, (but be sure they are *perfectly dry*); then apply the colour by gently working it on the Collodion by a light circular motion, using as small a quantity of colour at one time as possible. The object aimed at is to tint the Photograph, but not more; in fact, it is impossible to lay a very large body of colour on these pictures, and even if it could be done, the detail and shading would be lost. When the colour has been well worked in, blow off the excess by the India-rubber bellows.

In colouring portraits, after the face and hands have been gone over with the flesh colour, you can touch up the deep shadows with a small brush and Indian ink, used *wet*, but great care must be exercised or the colour will flow over the plate; moreover, too great a quantity of this touching will show; it should only be resorted to where there is a great deficiency in the shadows, or where it is requisite to hide spots or defects. If the pupil of the eye is not sharply defined, that may be sometimes strengthened by a clever artist.

At this point the whole of the superfluous colour which does not adhere to the picture is removed by the blower, and the varnish applied, when the remaining parts of the picture may be tinted—the cheeks are to be touched with a complexion tint, the flesh colour previously laid on will form a ground to work upon; the eyebrows and shadows of the face ought to be gone over with a little gray or black, to throw up the higher lights, &c. In colouring draperies, the lighter portions should be done first, and the darker parts filled in afterwards, the contrast made by one colour will serve to throw up that previously done.

The greatest difficulty will be found in colouring the skies; the light blue should first be put on, avoiding the clouds, which are finished with the horizon and distance colours—the large duster will be very convenient for toning down the tints.

The White (Solarization) is used for restoring the white collars, shirts, &c., which sometimes are discoloured by being over exposed, or faults in developing; care must be taken in using this, as it holds with great tenacity to the plate.

Gold chains, rings, &c., are touched with a little gilt obtained from a Gold Shell, by just wetting the brush; and is likewise to be used with caution, being very difficult to remove.

Flowers, fine buttons, or any very small articles, may be touched with a little water colour, but care must be used to prevent it spreading over the glass; and always use the bellows for removing the superfluous colour, as the moisture from the breath would make the colours work pasty.

Pictures produced by the Alabastrine process are coloured in the same manner, but should be varnished previous to any attempt being made to tint them. These pictures are also used to produce non-inverted or Chromo-Photographs; in this case the whole of the colouring is done previously to applying the penetrating varnish.

The picture having been varnished, and coloured more highly than is requisite for ordinary pictures, for the Penetrating Varnish reduces to a considerable extent the brilliancy of the tints, dust off the excess of colour, and with a suitable varnish the whole of this colour can be made to penetrate through the film and show on the reverse side.

The method of performing this operation will be to gently warm the plate and pour over the surface the Penetrating Varnish, allowing it to dry spontaneously.

The following are some of the principal colours used for Positives on glass :—

Flesh	Golden Yellow	Satin White
3 Complexions	Orange	4 Greens
Lips	Claret	Permanent Scarlet
Carmine	Distance	Pink
Carnation	4 Browns	Rose
Damask	4 Grays	Horizon
Lavender	Violet	White (Solarization)
4 Blues	Puce	Mauve
4 Yellows	Plum	

For Paper Pictures ordinary water colours in cakes are to be used.

The picture should be taken on Salted Paper in preference to Albumenized, and mounted on a stiff cardboard, using a solution of Dextrine or Gelatine for the purpose; when it is thoroughly dry, the surface will require preparation previous to applying the colours or they will run; this is often done by means of Parchment Size, but Newman's Preparation for sizing is superior. It is applied by means of a Camel's Hair Brush, and must be spread evenly and carefully: when the paper has become thoroughly dry, it is ready to colour.

Photographs taken on Albumenized Paper can be coloured with water colours by first washing the paper with the same preparation, which remedies the greasy nature of the surface.

The first thing to do in colouring a Photograph, is to lay in the flesh tint, which is made by mixing Venetian Red and Carmine, with the

addition of a little Yellow ; this should be laid on very lightly, that is to say, the colour must be reduced by water ; cover the whole of the face, hands, &c., with this wash, and allow it to dry. Now proceed to touch up the deep colours of the face ; the following colours will, in different proportions, be found extremely useful :—Carmine, Pink Madder, or Crimson Lake ; the colour for the lips should have a little Vermillion added to it ; the shadows of the face are to be gone over with a colour produced by mixing Cobalt, Carmine, and Indian Yellow, letting either the one or the other predominate, as the nature of the subject demands. The best method of working, is to lay on the repeated touchings by crossing the strokes of the pencil, working the face, &c., in a circular direction ; the strokes for the hair should be in wavy lines, not in straight scratches. In colouring the drapery, &c., care must be taken to keep the shadows well defined ; if it is a black coat or cloth, a little Chinese White must be added, to give a body to the colour, say Ivory Black and Chinese White : make a rather weak wash of this colour, and shadow with Sepia and Lake, but previous to putting in the shadows, go over the body colour with a wash of thin gum water, made by dissolving the best Gum Arabic in warm water, to which a small portion of sugar has been added ; the object of this is to prevent the second touches from working up the first wash. This shadow colour, with the addition of a little Indian Ink, makes a good colour for touching up Photographs that are not intended to be coloured.

DISTILLED WATER.

For the preparation of the Silver Bath used in the different processes described in this book, Distilled Water is recommended ; but the bulk in carriage and consequent difficulty in obtaining a supply renders a description necessary, for either its production or a substitute for it.

Distilled Water is readily produced by the aid of a still similar to *fig. 35* in the catalogue at the end of this book ; the body is half filled with water and then connected with the worm tub which is filled with water ; there is an Argand lamp supplied with the apparatus to generate the heat, and when the water in the retort boils, the steam passes through the worm where it is condensed, and slowly trickles out at the escape vent provided for it. The water in the worm tub soon becomes hot, and should be drawn off by the stopcock and a fresh supply poured in.

It is as well to know, that melted ice furnishes a supply of water quite equal to distilled, as water, in freezing, parts with all organic impurity ; therefore this source may often prove available.

The best substitute for Distilled, is rain, or soft river water, boiled and filtered ; it will answer for nearly all chemical purposes, but for washing paper, removing developing solutions, &c., there will not be any necessity

even for this trouble, the ordinary river water answering all purposes without any preparation, and only when it is extremely hard is there likely to be any ill effects arising from it.

WEIGHTS AND MEASURES.

All chemicals are bought and sold by Avoirdupois weight, except some liquids which are sold by the fluid ounce; the chemical proportions given in this book are by Apothecaries' weight and fluid measure.

APOTHECARIES' WEIGHT.

20 grains	=	1 scruple.			
60 "	=	3 "	=	1 drachm.	
480 "	=	24 "	=	8 "	= 1 oz.
5760 "	=	288 "	=	96 "	= 12 " = 1 lb.

There are $437\frac{1}{2}$ grains in the ounce Avoirdupois.

FLUID MEASURE.

60 minims	=	1 drachm.			
480 "	=	8 "	=	1 ounce.	
9600 "	=	160 "	=	20 "	= 1 imperial pint.